The science of cup stacking: a review of how prior research "stacks up"

By: Chris K. Rhea, Kathy Ludwig, Monique Butcher-Mokha

Rhea, C.K., Ludwig, K., & Butcher-Mokha, G.M. (2006). The science of cup stacking: a review of how prior research "stacks up". *IAHPERD Journal*, *35*(2), 21-22.

Abstract:

Sport stacking is used in more than 10,000 physical education, after school, and sports programs. Once considered a recreational activity, the sport now has state and national competitions. Sport stacking manufacturers claim the sport of sport stacking positively promotes hand-eye coordination, reaction time, and bilateral proficiency. Although anecdotal evidence supports these claims, there is some recent scientific literature behind sport stacking. The purpose of this paper is to examine recent developments in the science behind sport stacking. Specifically, this paper will explore five recent research papers that have studied the effects of sport stacking. The research suggests that some of the claims made by sport stacking manufacturers are accurate.

Keywords: sport stacking | cup stacking | hand-eye coordination | reaction time | bilateral proficiency

Article:

*****Note: Full text of article below**

Title: The Science of Cup Stacking: A Review of How Prior Research "Stacks Up"

By
Chris K Rhea, M.S.
Doctoral Student
Purdue University

Kathy Ludwig, Ph.D.
Assistant Professor
Barry University

Monique Butcher-Mokha, Ph.D.
Associate Professor
Barry University

Abstract

Sport stacking is used in more than 10,000 physical education, after school, and sports programs. Once considered a recreational activity, the sport now has state and national competitions. Sport stacking manufacturers claim the sport of sport stacking positively promotes hand-eye coordination, reaction time, and bilateral proficiency. Although anecdotal evidence supports these claims, there is some recent scientific literature behind sport stacking. The purpose of this paper is to examine recent developments in the science behind sport stacking. Specifically, this paper will explore five recent research papers that have studied the effects of sport stacking. The research suggests that some of the claims made by sport stacking manufacturers are accurate.

Teaching innovative and creative activities is a hot topic in physical education. Some physical educators and teacher education professionals call these activities "questionable" practices and rely on more traditional activities in their curriculum. A recent debate in JOPERD regarding questionable practices has been published in four letters to the editor (Baumgarten, 2004; Jacody, 2004; Murry and Udermann; 2004; Naughton, 2004).

Motivation is a common concern of many physical education teachers. Physical educators are continually seeking new ways to stimulate the interest of students in their physical education settings. They use a combination of traditional activities (e.g. basketball and volleyball) and nontraditional activities (e.g. sport stacking and juggling) in their curriculum. This allows the students to be introduced to a wide variety of physical movements. The debate is whether or not these nontraditional activities have a place in physical education.

While NASPE standards specify generally what students should be learning, physical educators are free to use the content and instructional methods they desire. For instance, the first NASPE standard states: A physically educated person "Demonstrates competency in motor skills and movement patterns needed to perform a variety of physical activities" (NASPE, 2004, p.11). Sport stacking manufacturers have made several claims about the benefits of sport stacking, one of which is that sport stacking has a positive effect on bilateral coordination. This is a very powerful statement, as bilateral coordination is used in nearly all sporting activities as well as activities of daily living. The development of bilateral coordination could assist in satisfying achievement of the first NASPE standard. If the manufacturers are correct, sport stacking would have a place in physical education.

Over 10,000 schools around the country have sport stacking programs in their physical education classes and after school programs (http://www.speedstacks.com). The popularity of the sport has helped support state and national tournaments all over the United States. Even though there is much anecdotal support for the sport, the question arises if sport stacking really does enhance psychomotor parameters in students or is it merely a fun activity. Recent research has attempted to clear up the answer.

One group of researchers (Udermann, Murray, Mayer, & Sagendorf, 2004) measured 42 second grade student's reaction times and hand-eye coordination times using sport stacking as an intervention. Sport stacking was taught to the experimental group for 30 minutes a day, four times a week, for five

weeks leading to a total of ten hours of stacking time. A control group was taught fitness themed physical education activities for the same duration. The results showed that the pre and post-test scores for the hand-eye coordination and the reaction time tests were significantly decreased in the experimental group, indicating they got better. The authors suggested that sport stacking did have a positive influence on the two variables they tested.

Conn (2004) assessed movement time in addition to reaction time in her study with 82 fourth-grade physical education students. In this five-week unit plan, sport stacking was randomly taught with scooter and volleyball skills, rather than being the only skill practiced by the students. The participants in this study stacked a total of 4 hours and 40 minutes. Significant differences were found in movement time, but no differences in reaction time. Conn concluded that sport stacking had no influence on reaction time, but did decrease movement time.

The influence of sport stacking on hand-eye coordination has also been investigated on 103 first, third, and fourth grade students (Hart, Smith, & DeChant, 2004). The students participated in a three-week sport stacking unit and were measured in three different aspects of hand-eye coordination. The total time spent stacking in this study was five hours. Significant changes were found in only one of the three hand-eye coordination measures. The researchers suggested stacking for a total of five hours during a three week unit plan may not be long enough to elicit psychomotor changes.

Rhea (2004) was the first to investigate upper limb coordination changes along with other psychomotor measurements. Sixth grade students participated in a four week sport stacking unit. The experimental group practiced sport stacking for 15 minutes during the beginning of the physical education class while the control group performed fitness activities. The sport stacking participants stacked for a total of 3 hours and 15 minutes. All students were pre and post-tested on a novel task consisting of a two-handed star tracer that is a measure of upper limb coordination. In addition upper limb movements were measured three-dimensionally on a computer motion analysis system. Positive significant changes were found in upper limb coordination using the star tracer and desirable changes were found in the cup clearance height in the experimental group, but not the control group. This was the first study that found sport stacking positively enhances upper limb coordination as measured the star tracer task.

Rhea (2004) also examined the enjoyment level of students participating in sport stacking. Following the study, students completed a survey with the following questions: "Rate your enjoyment of sport stacking on a scale of 1 to 5, with 1 being the lowest and 5 being the highest.", and "Are you interested in continuing sport stacking in your physical education class?" The average rating of enjoyment for sport stacking was 4.2, indicating that the students found it to be a pleasurable activity. Most students were also interested in keeping sport stacking in their physical education curriculum.

Hart and Bixby (2005) were able to show that sport stacking uses both sides of the brain. They performed an electroencephalogram (EEG) analysis on 18 college-aged participants. Following two 30 minute practice sessions with sport stacking, the researchers tested the brain activity of the subjects during one testing session. The EEG analysis showed that the left hemisphere of the brain was more active than the right hemisphere during right handed activities and vice versa.

Although the research is limited, there is scientific support for sport stacking in physical education curricula. More research needs to be performed on a variety of populations, including all age groups in the K-12 range. Also, other measurements of upper limb coordination, hand-eye coordination, reaction time and movement time need to be investigated in order to better understand the effects of sport stacking. Research on the student's enjoyment of other physical education topics should be compared to sport stacking to more thoroughly understand student's qualitative assessments of activities in their classes. More research will allow researchers to better identify the strengths and/or weaknesses of sport stacking. Presently, research suggests that sport stacking does enhance some psychomotor measures along with enjoyment of the physical education experience. Lastly, sport stacking has been shown to stimulate both sides of the brain.

References

Baumgarten, S. (2004). Questionable practices in physical education. *JOPERD, 75(5),* 4, 9.

Conn, H. E. (2004). The effect of sport stacking on reaction time, movement time, and ambidexterity in fourth-grade students. *Missouri Journal of Health, Physical Education, Recreation, and Dance, 14*, 8-16.

Hart, M., & Bixby, W. (2005). Brain Activation Patterns During Participation in Sport Stacking. *Research Quarterly for Exercise and Sport, 76(1),* 57.

Hart M., Smith L., & DeChant A. (2004). Influence of participation in a sport stacking unit on hand-eye coordination. *Research Quarterly for Exercise and Sport, 75(1),* 67.

Jacoby, T. (2004). Best, not questionable practices. *JOPERD, 75(6),* 6.

Murry, S. & Udermann, B. (2004). Research supports sport stacking. *JOPERD, 75(6),* 7-8.

Naughton, R. (2004). Dodgeball, relays, and rubber chickens. *JOPERD, 75(6),* 5-6.

National Association for Sport & Physical Education. (2004). *Moving into the future: national standards for physical education. A guide to content and assessment. (2nd ed.).* Boston: WCB McGraw-Hill.

Rhea, C. (2004). Changes in Upper Limb Coordination and Kinematics Following a Five

Week Instructional Unit in Sport Stacking. Unpublished masters thesis, Barry University, Miami Shores, Florida, United States of America.

Speed Stacks is the Leader in the Sport of Sport Stacking. (n.d.) Retrieved December 12, 2004, from http://www.speedstacks.com

Udermann, B. E., Murray, S. R., Mayer, J. M. & Sagendorf, K. (2004). Influence of sport stacking on hand-eye coordination and reaction time of second-grade students. *Perceptual and Motor Skills, 98,* 409-414.

Corresponding Author:

Chris Rhea, M.S.
Department of Health and Kinesiology
800 West Stadium Avenue
Purdue University
West Lafayette, IN 47907-2046
Phone: 765-494-8401
Fax: 765-496-1239